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Minutes of Pandora Meeting of April 21, 1969 (u)

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SUMMARY OF PANDORA MEETING

HELD: April 21, 1969

- I. Detailed minutes attached. Same classification and instructions:
- II. Meeting organized in three parts:
  1. Review of "Big Boy":
    - A. Purpose: Elucidate effects on man of microwave radiation (radar) by comparing ship's crew groups apparently exposed to radiation to groups protected from radiation (below deck and remote stations). Studies on USS Saratoga in two stages (i) dock side in preparation for shakedown and (ii) shakedown, i.e., underway and operational.
    - B. Findings: No significant differences in psychological tests performed on the apparently exposed and control groups. Also, no apparently significant differences on genetic (leucocyte) and physical findings. Thus, studies generally proved negative. Detailed report due from Dr. Kubis.
    - C. Radiation Findings: Detailed survey of on-board radiation levels revealed that levels were considerably lower than anticipated, i.e., in most cases levels varied from 0.3 to 0.03 mw/cm<sup>2</sup> and in no case greater than 1 mw/cm<sup>2</sup>. Radars were operating 80 to 90 percent capacity.
    - D. Summary and Conclusions To Date: Saratoga study verified testing procedures and provided useful information for developing human radar-field testing. However, studies were negative since exposures were very low.
  2. General discussion of ARPA contracts relative to bio-medical effects of microwave:
    - A. Dr. Brazies' studies of CNS tissue exposed to microwave radiation reviewed. Recommendations: to accelerate contractor's efforts as urgent and to extend samples. Attempt to get reports from

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contractor for inclusion in general report to panel as soon as possible.

- B. Contract with Dr. Ross Adey reviewed. Recommendations: Although Dr. Adey's efforts bear on the general problem of the effects of radiation and fields on CNS functions, they are not directly contributory to priority ARPA questions. Since he is furnishing valuable EEG evaluation services as well as contributing to the general field, it was suggested that he be encouraged to deal more directly with priority questions and also to continue support for present. As Walter Reed capability develops, if contractor's interests tend away from ARPA interests, support should be phased out.
- C. New England Institute for Medical Research (Dr. Heller) program regarded as not contributing directly to ARPA high priority question although the contractor has capabilities in the area.
- D. Work at Milton Zaret Foundation attempting to confirm or reproduce U. S. S. R. work. Review for information to panel.
- E. The Lilienfeld studies conducted several years ago were reviewed, since a new proposal was being developed to extend the earlier studies. It was concluded that, due to the size of the Baltimore area mongoloid population and incidence, the scope of the study could probably not be increased by more than 50 percent. It was recommended that (i) scope not be extended beyond the Baltimore region, e.g., Washington area, (ii) that the program be regarded as a multiphase effort and that Phase 1 should be funded. If findings of Phase 1 indicated that further studies would be promising, then later phases could be considered for funding. Thus, proposal should include in-depth follow-up of original cases as well as new cases uncovered. See detailed minutes.
- F. Studies of Dr. Dordano (Johns Hopkins), Dr. Sol Snyder, and Dr. Justison were reviewed for information.

### 3. General Discussion

- A. Priorities of ARPA interests in the microwave field were reviewed. High priority still assigned to evaluating the significance of Moscow Signal and also, in the general context, the biomedical effects of microwave radiation on humans such that meaningful safety standards can be set.

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- B. It was agreed that there is at present insufficient evidence to draw conclusions. In answer to questions about whether or not other studies (aside from those supported by ARPA) are likely to or have shed light on the problem, it was concluded that the only known study not included herein was that of Dr. Jacobson (George Washington School of Medicine) on young women exposed to Moscow Signal. Findings may indicate abnormal genetic activities in some of the women. Significance is not established. There was general discussion of chromosomal aberrations, and its causes.
- C. It was recommended that further studies be developed:
1. Walter Reed facility and program advancement be encouraged. Extend animal studies and initiate human studies. Suggestions for protocols were made, e.g., study include four men involved for six to eight months. Study to be in two groups and double-blind.
  2. Programs to be developed to take advantage of land-based radar installations.
4. It was recommended that the Walter Reed group prepare and present a detailed review of the field, i.e., their activities with reports of their findings, protocols, etc., since projects were begun. Also, a review of relative contract work supported by ARPA and related to Walter Reed efforts as well as any related studies of others in field.

Respectfully submitted by Lysle Peterson, Chairman

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Date Typed - May 15, 1969

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DETAILED MINUTES OF PANDORA MEETING OF APRIL 21, 1969

Meeting Convened: 0930

IDA Rm. No.: 10K5

Present:

Science Advisory Committee

Walter Reed Army Institute of Research

Dr. Joseph E. Barmack  
\*Dr. H. Allen Ecker  
General Frederic J. Hughes, Jr.  
Dr. Joseph F. Kubis  
Dr. Lysle H. Peterson, Chairman  
Dr. Herbert Pollack

Colonel Joseph V. Brady  
Dr. Thomas W. Frazier  
\*Mr. T. Daryl Hawkins  
Colonel Merrill C. Johnson  
Major James T. McIlwain

\*Mr. John F. Collins (CNO), USN  
Mr. H. Mark Grove, Wright-Patterson AFB  
Mr. Albert Rubenstein, ARPA  
Mr. Harris B. Stone (CNO), USN

\*First Attendance

Dr. Pollack reviewed events since previous meeting. He noted the formation and meeting of a new committee (ERMAC\*\*) from the Office of Emergency Planning and chaired by General James D. O'Connell to consider microwave radiation. This panel resulted from legislation setting HEW as the responsible agent for microwave radiation health considerations. He also noted that a document had appeared by Mr. Rexford Daniels under contract to the Office of Telecommunications Management. This document has been classified. He then noted that "Big Boy" shipboard exercise had been completed insofar as the dock-side and shakedown cruise activities aboard the Saratoga. Dr. Kubis would be submitting a report of activities and findings to date.

Dr. Kubis reviewed "Big Boy" objectives and events to date:

- A. Objective: To study certain behavioral and physical functions of selected crew aboard the Saratoga in order to ascertain effects of microwave radiation on man regarding shedding light on effects of Moscow Signal, i.e., nonthermal effects (if any) of radiation of radar origin.

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B. Procedures

1. Three groups of ship's crew were selected:
  - a) Flight deck crew (eight in number).  
Highest levels of exposure expected.
  - b) Hangared deck crew (fifteen in number).  
Low levels expected.
  - c) Look-out crews (eight in number). No  
exposure expected.
2. Dock-side control tests conducted from Jan. 27 through Jan. 30, 1969. Five-man team under Kubis with excellent cooperation of naval medical personnel. (Details will be included in Dr. Kubis' report.) Batteries of tests included performance (e.g., aiming, depth perception, etc.) and written procedures. Also, base-line physical exams were given.
3. Seagoing tests were performed while ship was under way for shakedown cruise Jan. 30, 1969, through Feb. 10, 1969.
4. Summary: Sixty-seven tests were performed in three days at dock-side, and ninety-two tests were performed at sea. Forty-seven tests represented retesting of control material. There were a number of disturbances regarding shipboard routine, etc., e.g., high noise levels, P-A system interrupted activities in "quiet room," general quarters, intrusions into test areas due to routines, variable line voltage which affected equipment. Three dock-side test days conducted by five-man team; eight sea test days conducted by three-man team. It was regarded by Dr. Kubis that the testing was satisfactory and that the interruptions were not significant. Most test procedures were good (0.9); some were poor (greater than 0.1).
5. Findings: There were no significant differences in the dock-side tests, i.e., among groups, and there were no significant differences among groups in the under-way tests, i.e., about 50 percent showed some increases in performance scores and about 50 percent showed some decreases. It was recommended that isolated power supply for instrumentation be developed if further work is to be done aboard ship.

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Mr. Mark Grove reviewed the measurements and monitoring of shipboard radar levels. The ship was swept re two primary radiation sources, i.e., SPS-30 (S-band radar) and SPS-43 (UHF) search radar. It was expected from a naval electronics lab report that there might be greater than  $10 \text{ mw/cm}^2$  on at least 80 percent of the surface of the deck (data from destroyers). Mr. Grove and Dr. Kubis were on ship at the same time but worked independently. Used RAMCORE dosimeter, HP power meter with thermistor bridge (re S-band) from island to bow, 9 decks.

*at Top level without entry of structure*  
 $0.036 \text{ mw/cm}^2$   
*dirty cycle*  
 $0.05$   
*Peak*  
 $0.75 \text{ mw/cm}^2$

Findings: In no case did measured levels exceed  $1 \text{ mw/cm}^2$  with radar operations at 80 to 90 percent of utilization rate. Ranges of findings were in most cases less than 0.3 to  $0.03 \text{ mw/cm}^2$ . It was noted that verbal reports from shipboard engineers, i.e., engineering center and ship's hazards group, had indicated these findings. It was suggested that such reports had been made to the SEC.

C. Discussion:

1. Cover story considered appropriate and worked well (Robert Stone).
2. Aircraft radar and HERO effects were discussed. Effects and indications were insignificant.
3. Radiation from radar generators considered, i.e., 50 to 100 KV X-ray generation from tubes. Considered that lead shielding was adequate.
4. Mr. Rubenstein indicated that there were several excellent land-based radar sites which might be appropriate as study sites.
5. Blood studies from Saratoga crew were discussed. Colonel Johnson reported that twenty-one samples were recovered at San Juan. Seventeen successful cultures obtained with 288 spreads photographed. These were coded for double-blind studies. Code not yet revealed. Although two abnormalities were found, they were regarded as in normal range.
6. Several discussions of genetic aberrations of leucocyte nuclei covered several areas:
  - a) Colonel Brady's three monkeys exposed to date at Walter Reed (thirty days) to special signals. One of these was the initial one showing abnormal chromosomal changes. Plan now is to get samples during exposure and with larger group of animals.

*lowest Power*  
 $0.002$   
*dirty cycle*  
 $0.003$   
*Peak*  
 $0.66 \text{ mw/cm}^2$   
*Not in main beam*  
*Side lobe*  
 $0.25$

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*main beam*

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- b) Dr. Pollack reported the studies of Dr. Jacobson at George Washington University who has studied young women returning from embassy in Moscow (State Dept. contract). One hundred forty blood samples were examined over a four-year period of time. These specimens were identified only by code numbers. Four of these reportedly showed serious chromosomal abnormalities. Colonel Johnson reviewed these reported findings with Dr. Bender of Oakridge. The latter expressed the opinion that the evidence was based upon weighted data which may not be acceptable to all experts in the field.
- c) Dr. Johnson described the general character of chromosomal abnormalities re probabilities, stillborns, mongolism, chemicals, and drugs, etc. It was described that while bone marrow, testicular tissue, etc., might be better tissue to study (higher rates of replication), most knowledge is based upon leucocyte studies.
- d) The older Lilienfeld (Johns Hopkins) studies were of Korean and WW II veterans relative to the incidence of mongoloid children born to them. It was concluded that the earlier study was not well designed to reveal data regarding current interest. Study indicated that eighteen of twenty-five mongoloid children had fathers who had been exposed to radar. It is now proposed to expand the study in Baltimore and possibly in Washington. It is likely from the incidence and population of mongolism that the number cannot be increased beyond 50 percent, i.e., from twenty-five to about thirty-six. It was suggested that the original twenty-five and additional cases should be studied in detail, i.e., cytogenetic studies of testicles and lymphocytes. It is also concluded that the study may not answer the question. It was proposed that the study should cost \$100,000; \$50,000 from ARPA and \$50,000 from NIH. The objective should be to validate the earlier study; i.e., cross-validation seems appropriate. The study may be regarded as in three phases. Phase 1 may be supported. Later phases should not be funded unless Phase 1 defines an appropriate study, i.e., a milestone decision should be made.

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7. General discussion concluded that additional work is required to investigate whether or not appropriate radiation levels and type have genetic effects on man. Shipboard versus land-based studies were discussed. It was concluded that land-based radar studies should be seriously considered and planned if appropriate. Details of George Washington University study were lacking to the group.
8. Dr. Brazier's (New Orleans) studies on material sent from Walter Reed are not completed as yet. Contractor does not know what the exposure is nor in which animals. (Does know that it is microwave.) He reported that one monkey (exposed to special signal) showed significant changes in the auditory and visual cortex but not in deeper structures. He is now studying two other monkeys and four dogs. These reports are due this year.

It was concluded that the contractor should be urged to proceed as rapidly as possible, i.e., with urgency.

9. It was concluded that more animals should be exposed and studied. There was discussion of the new facilities developing at Walter Reed. They are expected to be completed soon.
10. Contract with Dr. Ross Adey reviewed. Adey's studies have been concerned with modulated A. M. (3 to 10 cps) and C. W. (4.6, 2 v/meter) and S-band radar modulated with EEG. He is continuing monkey studies regarding EEG and reaction-time. He has a contract with Northrup for the study of reaction times in electrostatic fields. It is felt that, although Dr. Adey's work is not directly concerned with the important questions of the effects of VHF on CNS function and that of excluding the electrical effects as artifacts, his work is related to the general field of the effects of radiation and CNS function. Also, he is assisting Walter Reed with EEG evaluation and data processing. Current level of support is about \$135,000 annually. It was concluded that Dr. Adey should be informed that his own priorities and work trends are not entirely matched with those of ARPA. Although his work is related to the general field and is of considerable assistance to the Walter Reed effort, it is thought that his support might be phased out in a year or two after the Walter Reed facility is better developed.

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11. A contract already funded by ONR with New England Institute for Medical Research (Dr. Heller) was reviewed. It was suggested that the content of this work is not directly appropriate to this subject although that institute has a microwave facility.
12. A contract with the Milton Zaret Foundation of Scarsdale, New York, was reviewed. Contractor also uses facilities of Brooklyn Polytechnical Institute. Work primarily in 700 p.p.s. (1-10 u. sec.) range. Is attempting to confirm or reproduce Myrra, Czechoslovakia, work, i.e., production of differences in heart rate at subthermal levels. This review was for information.
13. Other contracts were also reviewed:
  - a) Dr. Dordano of Johns Hopkins in A. M., P. M., C. W., S-band frequency work on monkeys.
  - b) Dr. Sol Snyder of Johns Hopkins is studying neuropharmacological effects, e.g., turn-over rates of norepinephrine and serotonin.
  - c) Dr. Justison (Kansas City, Missouri) using microwave Tappin oven is studying hypnotic and soporific effects of low power level microwaves. It is thought that the geometry of the oven may provide higher power levels than predicted.
14. It was estimated that current funding in the area is \$500,000 outside and \$200,000 in-house (does not include reconstruction and development costs at Walter Reed or computer facility).
15. It is regarded that the new facility providing three chambers and data processing including (Hewell Packard) general purpose computing, record and reproduce capability for time series, coherence, cross- and auto-correlations, etc., and real time capability will be ready between mid-June and August.
16. The priority of questions of interest to ARPA was discussed. It was reiterated that the elucidation of the Moscow Signal remains as a high priority question within the general field of the effects of microwave radiation on man in order that safety standards may be rationally developed. It was also noted that, aside from the work of Dr. Jacobson, there was apparently no other relative work being conducted by Federal Agencies.

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17. The need for information on humans in addition to the accelerated animal studies at Walter Reed was emphasized. Therefore, it was urged that the Walter Reed facility develop a human program and start immediately to develop Phase 1, i.e., to develop a plan and protocols.
  - a) Suggested putting the human aspect into the Pandora program rather than in the Walter Reed stress program.
  - b) Estimated that human subjects would be required for six to eight months and that they could be obtained from Ft. Dietrich.
  - c) Controls should also include as many variables as possible including IQ, memory and performance testing. Control period should be less than sixty days. One or more should go through the entire procedure without exposure, and one or more with alternating exposure plan. Study should be double-blind with protection of eyes and gonads. Shielding of testicles is recommended.
  - d) Panel would like to review protocol before enactment.
18. Land-based radar station human study program should be developed to replace or supplement any on-board studies at sea.

Respectfully submitted by Lysle Peterson, Chairman

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Date Typed - May 16, 1969

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